Hydrometeor Characteristics of the Cloud Population during DYNAMO

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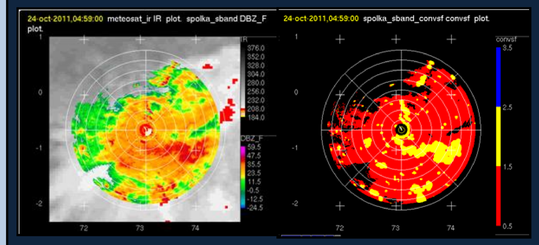
S-PolKa

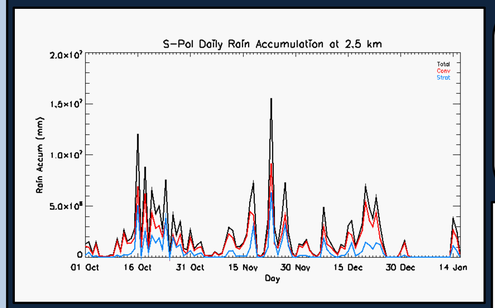


Goals of S-band:

-Observe the convective population and transition from shallow to deep (MCSs)

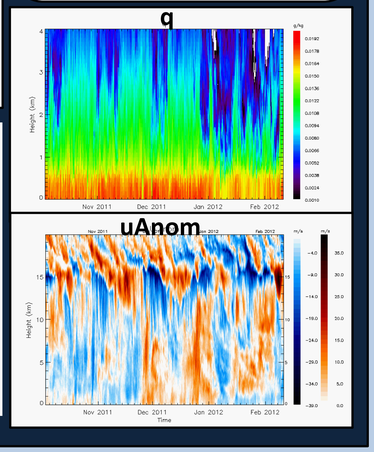
-Provide details on airflow within the storm

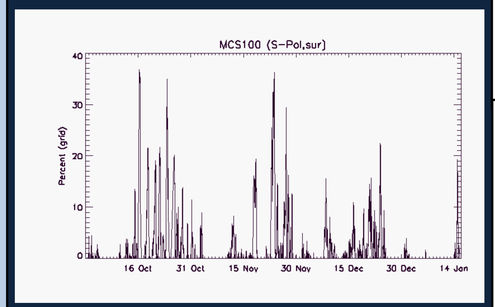
-Provide highly resolved hydrometeors information



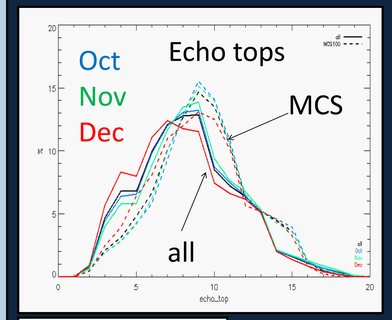
-S-band data partitioned into convective/stratiform and MCS/sub-MCS (100 km threshold)

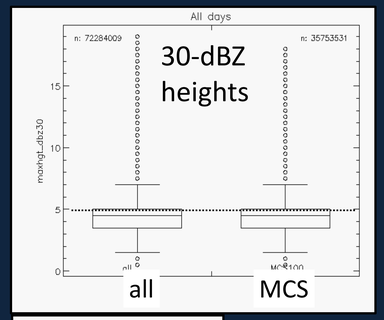
-Increased rainfall and MCS activity during active MJO periods (late Oct., Nov., and Dec.) coinciding with periods of deep-layer moisture

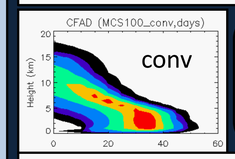




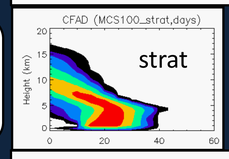
REFLECTIVITY DISTRIBUTIONS



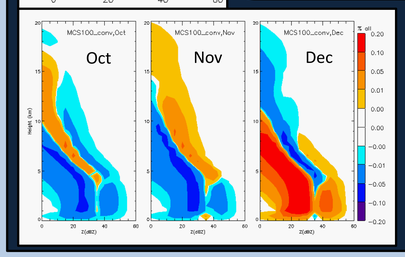


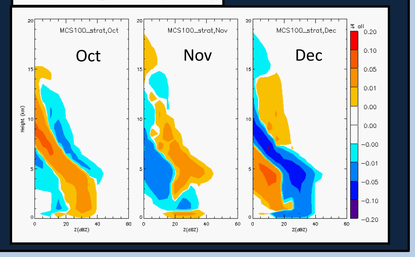


-Shallower in Dec, but strong in low levels
-Max 30-dBZ height at or within a few km of melting level

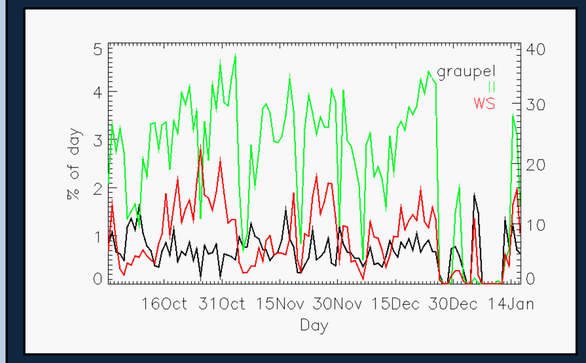


-More intense brightband in Nov, especially compared to Dec





HYDROMETEOR STATISTICS



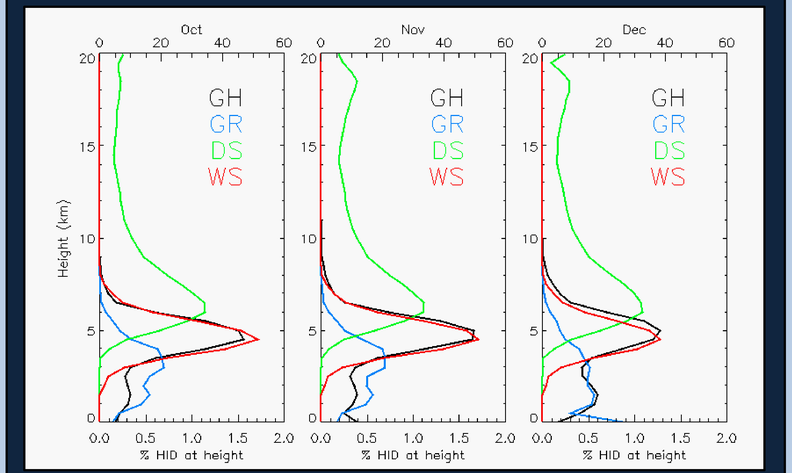
-Highest daily % PID: ice crystals

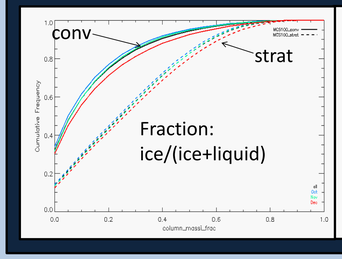
-Wet snow peaks during active periods (MCS)

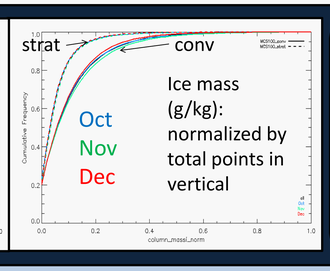
-Similar graupel % with time

-Graupel limited to near melting level

-Slightly less wet snow during Dec



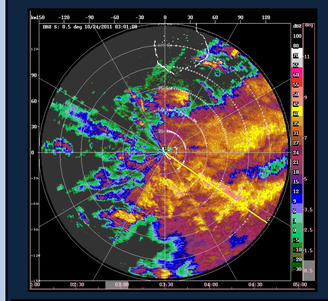




-Greater ice fraction (mass) for strat (conv)

-Similar ice fraction and mass for each month

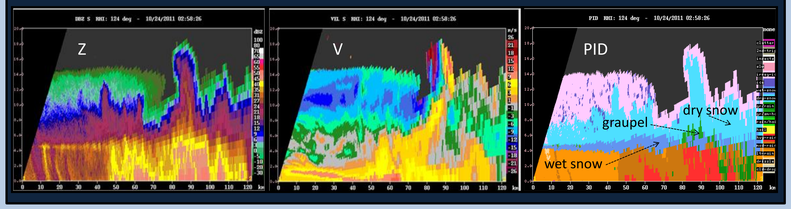
MCS EXAMPLE



-October and November featured MCSs characterized by widespread, westward-moving stratiform and embedded, eastward-moving convection

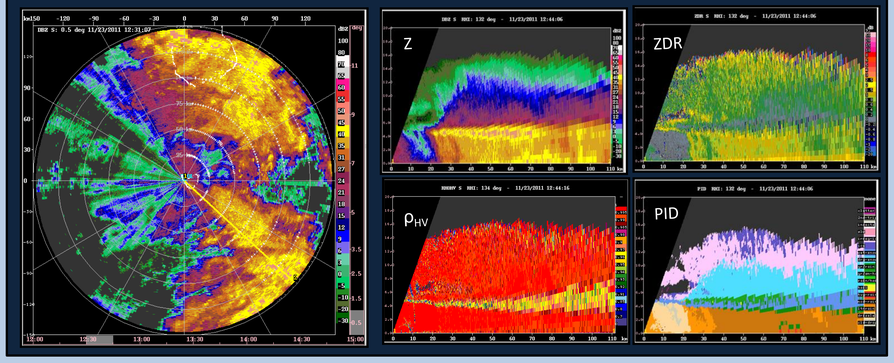
-At times, convection reached 18 km in height with upper-level divergence and graupel within a few km of the melting level

-Convection decayed, contributing to the widespread, persistent stratiform echo



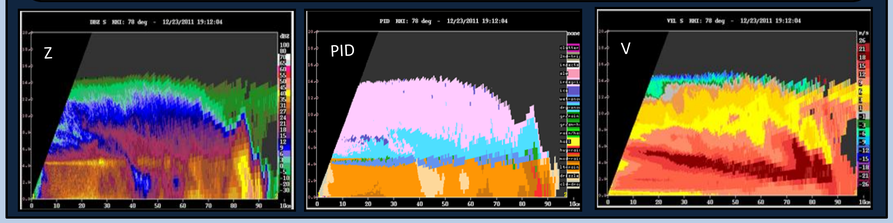
STRATIFORM

Vertical cross sections through widespread stratiform echo on 23 Nov (for example) show an intense brightband signature with reflectivities of ~50 dBZ. The PID reveals shallow layers of graupel above and below the wet snow near the melting level. Is this real?

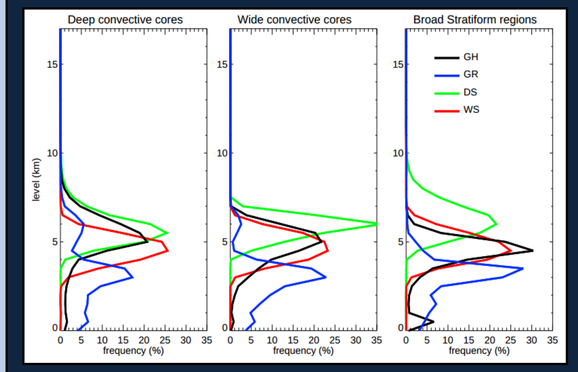


DECEMBER

An example from December shows shallower convection (as suggested in the statistics) and a pronounced rear inflow jet, beginning above the melting level and descending throughout the stratiform region. This indicates a downward transport of the westerlies, highlighting the role of microphysics in momentum transport.



FUTURE WORK



-Profiles of PID partitioned following classifications of Zuluaga and Houze (2013)

-Graupel observed at greater heights in deep convective cores

-Dry snow extends to greater heights in broad stratiform

-Graupel/small hail peaks above wet snow in convection

-Continue to investigate the evolution of hydrometeor characteristics as the cloud populations transitions from shallow to deep convection then to broad stratiform

-Validate PID through comparisons with aircraft data

-Present PID information for comparisons with model microphysics output

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